Establishing private data collections on IBM Blockchain platform for healthcare applications

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ABSTRACT

 On a healthcare platform, there are multiple bodies such as the drug manufacturers, wholesalers, pharmacies, and patients. These organizations share data about the creation of the drug. However, there are some cases where entities want to keep some data about the drug unseen from the other entities. Consider the example where a manufacturer has arranged different price rates with the wholesalers. They wouldn't want the various wholesalers to be able to see the differing negotiated drug rates. Having all entities on the same blockchain channel would congenitally make every transaction between any two entities, visible to every other entity. With the introduction of private data collections, certain data parts related with a given transaction can be kept private from other entities. In our project, we showcase one manufacturer, two wholesalers, one pharmacy, and one patient that are connected on the same channel on a blockchain ledger. The manufacturer brings about a new drug and sells it at different prices to the two different wholesalers. Only the manufacturer and the patient can see the two varied prices for this example.

KEYWORDS: Blockchain, Hyperledger Fabric, Private Data Collections.

I.   INTRODUCTION

Blockchain is a decentralised node network that stores the data. It is an eminent technology for protecting private data within the system. This technology helps to exchange analytical data and keeps it secure and confidential. It is a best tool to hold all the related documents in one location and securely. Blockchain also speeds up searches for applicants that fulfill specific trial criteria using a single patient database. The Blockchain can be expressed as a decentralized peer-to-peer (P2P) network of personal computers called nodes, which maintains stores, and records historical or transaction data.

In healthcare, Blockchain has a broad applications and functions. The ledger technology helps healthcare researchers uncover genetic code by assisting the secure transfer of patient medical records, controlling the drug supply chain, and facilitating the safe transfer of patient medical ledger. Protection of healthcare data, various genomics management, electronic data management, medical records, digitalized tracking and issues outbreak, etc., are some of the theoritically derived and impressive features employed to develop and practice Blockchain technology. The complete digitalized aspects of Blockchain technology and its use in healthcare-related applications are the significant reasons for its adoption.

II. EXISTING METHODS

There is an raise interest in digitalizing healthcare systems by governments and related industry sectors, partly indicated by various initiatives taking place in different countries and sectors. For example, the then U.S. president signed into law the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, as part of the American Recovery and Reinvestment Act of 2009. HITECH is designed to hearten broader adoption of electronic health records (EHRs), with the ultimate aim of benefiting patients and society. The potential profits associated with EHR systems (e.g. public healthcare management, online patient access, and patients medical data sharing) have also fascinated the interest of the research community. The potential of EHRs is also evidenced by the recent 2019 novel corona virus (also referred to as 2019-nCoV and COVID-2019) pandemic, where distant patient monitoring and other healthcare deliveries

are increasingly used in order to contain the circumstances.

In modern times, there is an increasing trend in deploying blockchain in a broad range of applications, including healthcare (e.g. public healthcare management, counterfeit drug prevention, and clinical trial) (Esposito, Santis, Tortora, Chang, Choo, 2018, McGhin, Choo, Liu, He, 2019, Peterson, Deeduvanu, Kanjamala, Boles, 2016). This is not shocking, since blockchain is an immutable, transparent and decentralized distributed database (Ahram et al., 2017) that can be purchased to provide a secure and trusty value chain.

III. PROPOSED METHOD

In this pattern, we showcase 1 manufacturer, 2 wholesalers, 1 pharmacy and 1 patient connected on the same channel on a blockchain ledger. The manufacturer originates a new drug pill, and sells it at discrete prices to the two wholesellers. Only the manufacturer and the patient have visibility to the two negotiated prices for this example.

This code pattern is for developers who want to learn how to use the private data collections feature introduced into Hyperledger Fabric. When you have completed it, you will understand how to:

- Create multiple organizations with the IBM Blockchain Platform.
- Create a VueJS web app that has multiple dashboards on a Single Page Application, which can communicate in real time with each other.
- Create a NodeJS server that is deployed to Kubernetes on IBM Cloud.
- Use private data collections to enforce data privacy between organizations on the same channel.

IV. Methodology
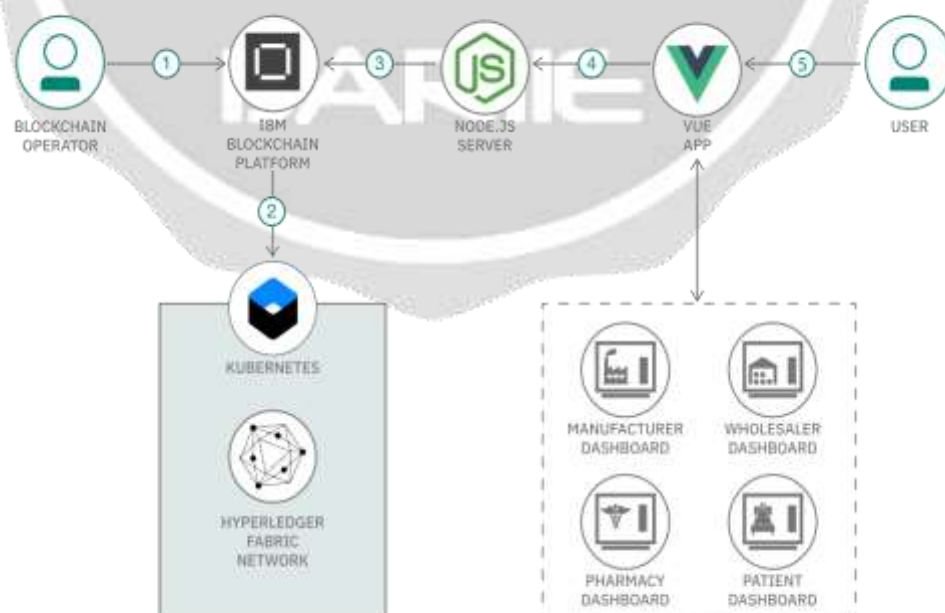
1. IBM Kubernetes Service cluster and an IBM Blockchain Platform 2.0 service are created by Blockchain operator.
2. A Hyperledger Fabric network will be created on an IBM Kubernetes Service by the IBM Blockchain Platform 2.0, and the operator installs and instantiates the smart contract on the network.
3. Using Fabric SDK, Node.js application server interacts with the deployed network on IBM Blockchain Platform 2.0.
4. The Node.js application API interacts and submits transactions to the network using React UI.
5. The user associates with the supply chain application web interface to update and query the blockchain ledger and state.

4.1 Included components

- **IBM Blockchain Platform** gives you total control of your blockchain network with a user interface that can simplify and accelerate your journey to deploy and control blockchain components on the IBM Cloud Kubernetes Service.

- **IBM Cloud Kubernetes Service** creates a cluster of enumerate hosts and deploys highly available containers. A Kubernetes cluster lets you securely manage the resources that you need to quickly deploy, update, and scale applications.

4.2 Featured technologies

1. **Nodejs** is an open-source, cross-platform JavaScript run-time environment that executes JavaScript code server-side.
2. **Vuejs** is a progressive framework for building user interfaces.
3. **Bootstrap** is a free and open-source front-end Web framework. It contains HTML and CSS-based design templates for typography, forms, buttons, navigation and other interface components, as well as optional JavaScript extensions.
4. **Docker** is a computer program that performs operating-system-level virtualization, also known as Containerization.

V.RESULTS

Here are some of the screenshots that we have tested and obtained output.
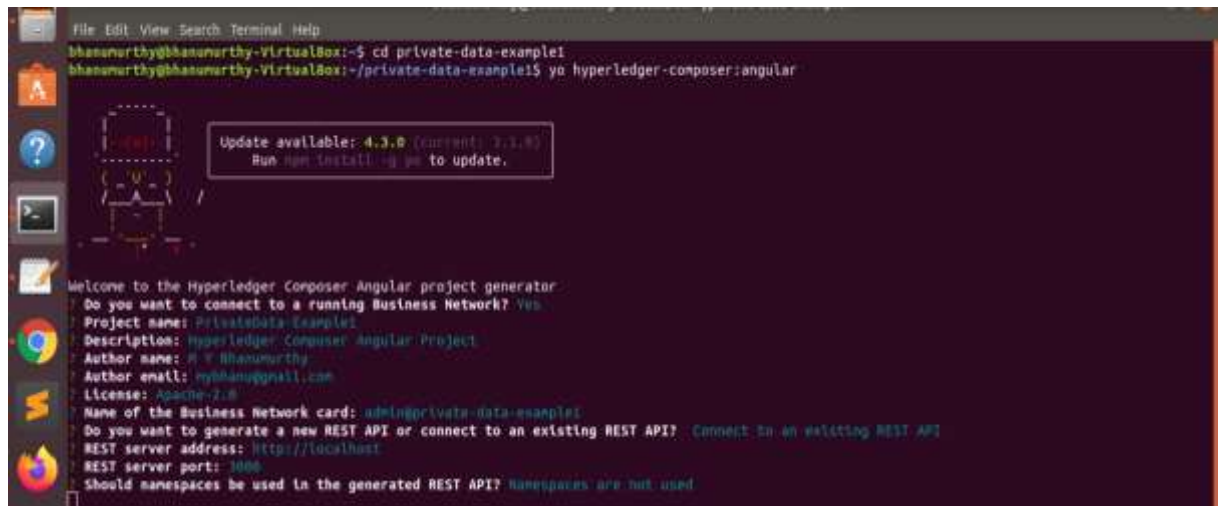
Fig 1: Yeoman Angular Frontend

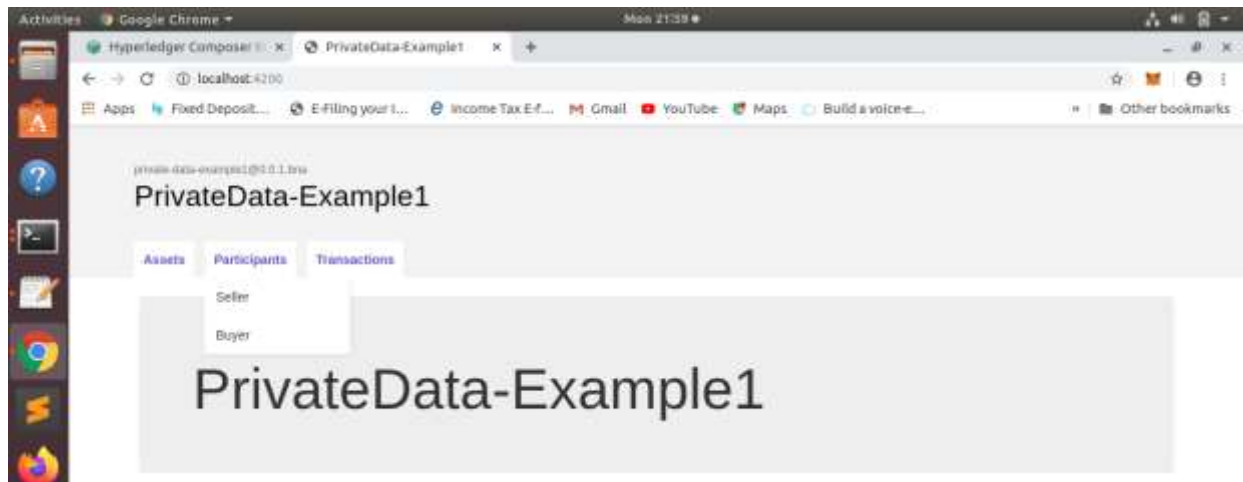Fig 2: App Frontend

Fig 3: Assets in App
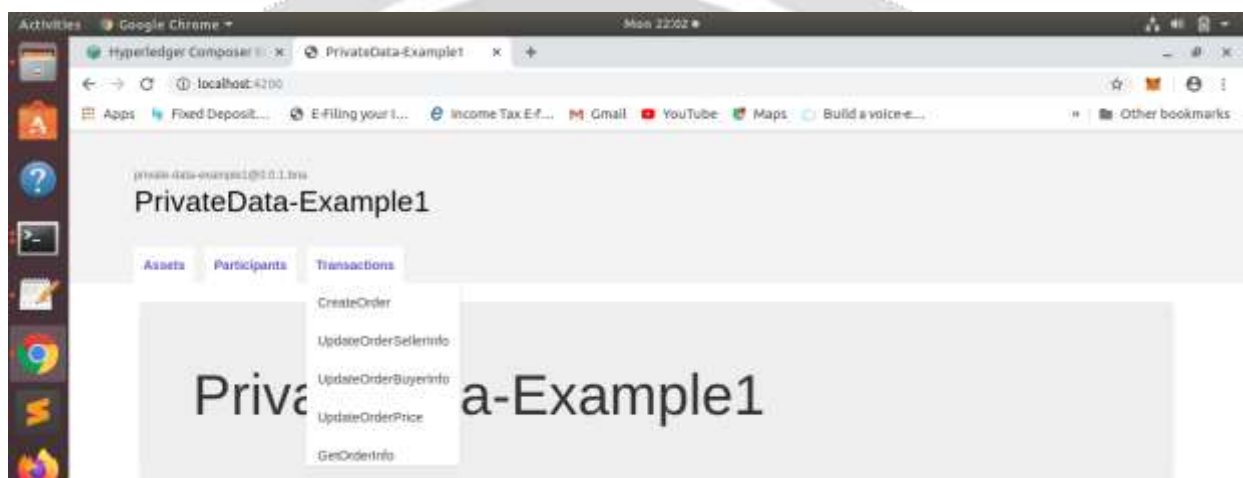
Fig 4: Participants in App

Fig 5: Transactions in App

VI   CONCLUSION

We have presented an efficient and robust technique that automatically detects duplicate regions Blockchain Technology is relatively new in the field of
computing and healthcare as well. This technology has great potential in the sub-sectors of the healthcare field solving the major issues with its features and properties. Technology has the potential to revolutionize the whole ecosystem. Providers, patients, and research organizations are more focused on its initial journey and needs more research however the intense research work must be carried out in health insurance and pharmaceutical supply chains. Blockchain technology is also observed with some challenges while an implementation that needs to be solved with further research. Threats to the validity of our study discussed above may lead to better future work of this research work.

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IV REFERENCES

https://github.com/IBM/private-data-collections-on-fabric

https://docs.docker.com/install/linux/docker-ce/ubuntu/

https://hyperledger.github.io/composer/latest/installing/installing-prereqs.html

https://hyperledger.github.io/composer/latest/installing/development-tools.html